

Remote-sensing Supported Analysis of Soil Properties in Water Conservation Area 1, Everglades

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ABSTRACT

Understanding linkages between soil properties in wetlands and above-ground landscape patterns is critical to develop quantitative soil-landscape models. The objective of this study was to investigate spatial relationships between soil and vegetation patterns using field and remote sensing data in a subtropical wetland. A total of 131 locations were sampled in Water Conservation Area 1 (WCA 1), Florida. Two layers (floc and 0-20 cm soil) were analyzed for bulk density (BD), total carbon (TC), total calcium (TCa), total nitrogen (TN), and total phosphorus (TP). A vegetation map was used to delineate vegetation types and a Landsat remote sensing image was used to delineate various spectral indices: Normalized Difference Vegetation Index (NDVI), NDVI green and Normalized Difference Water Index (NDWI) values. Geostatistical methods were used to interpolate site-specific soil properties across the study area. The GIS-based analysis comprised zonal statistics to calculate means and variance of floc/soil properties stratified by geographic features (buffers) at specific distances from nutrient influx structures, vegetation classes, and spectral values. High TP and TCa were associated with cattail, an invasive species, as well as geographic locations in proximity to nutrient influx structures. Total N showed little variation across WCA1 and no significant correlation with any vegetation species. The NDVI and NDVIgreen showed significant different signatures among open water, hardwood swamp and sawgrass marsh as well as cattail. The NDWI was well suited to distinguish between open water and vegetation classes but less so among different vegetation classes. In summary, spectral data derived from remote sensing images showed relationships to underlying soil properties in this subtropical wetland. These relationships can be used in future studies to produce high-resolution soil property grids for wetland soils.

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